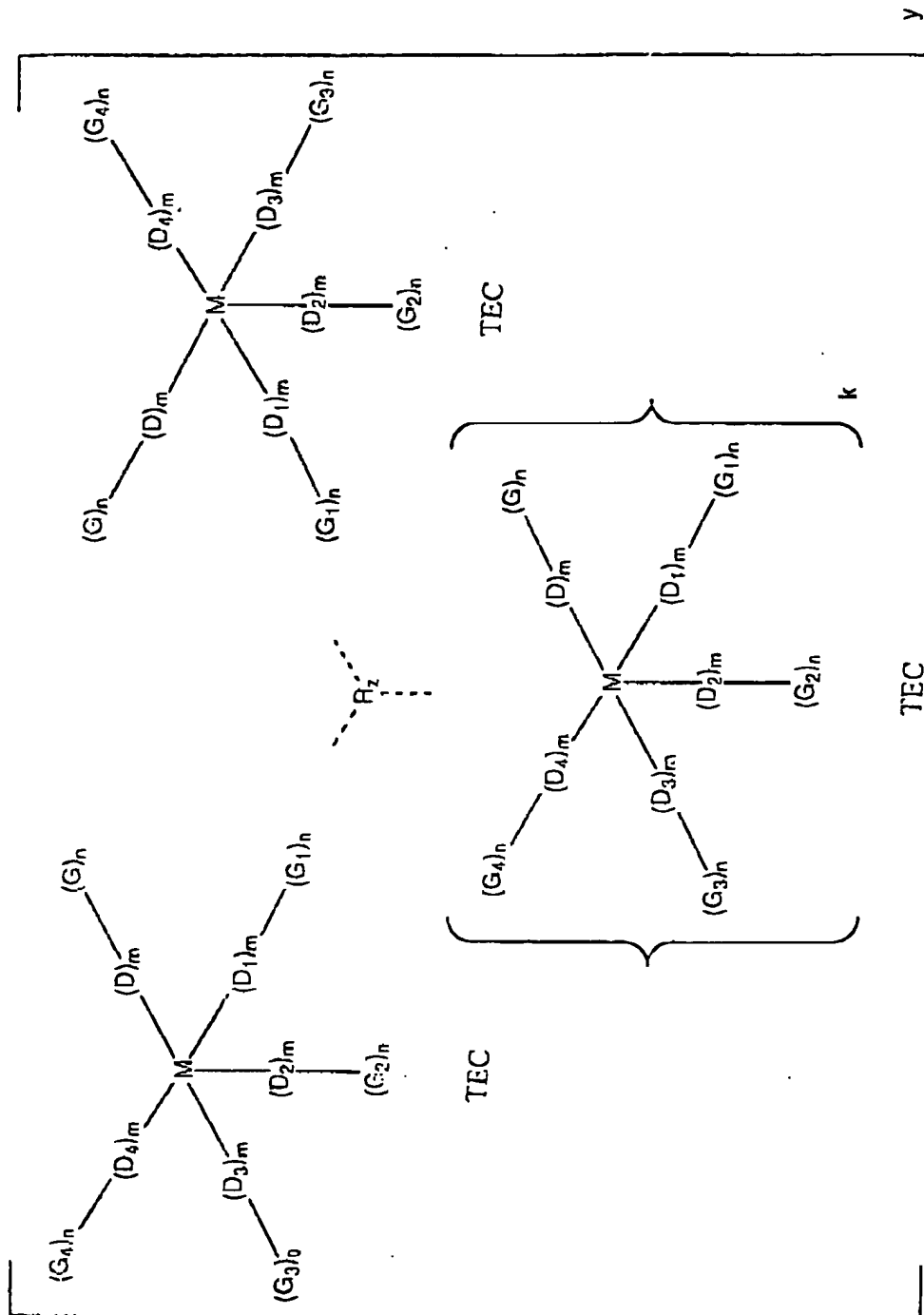


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AMENDED CLAIMS:

1. (Once Amended) A process for selectively adsorbing a component of a gas mixture, which comprises contacting the mixture with a solid state, selective adsorbent material comprising a porous framework of a plurality of transition element complexes (TECs) having the formula shown below in Figure 1,



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wherein:

- (a) M is a primary transition metal ion;
- (b) D to D₄ are primary donors and m is zero or one, at least three of D to D₄ occupying primary donor coordination sites on M but leaving at least one open coordination site on M for the component to react with M;
- (c) G to G₄ are functional groups and n is zero or one, at least one of G to G₄ being intramolecularly bonded to at least three adjacent primary donors to form at least one 5 or 6 member chelate ring on the primary transition metal ion and providing at least three donors thereto;
- (d) M, D to D₄ and G to G₄ together define one or more transition metal complexes, wherein said complexes are the same or different and wherein k is from 0 to 4;

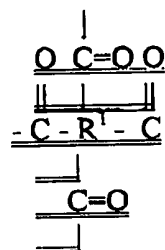
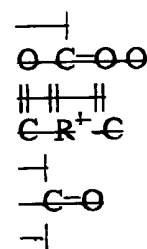
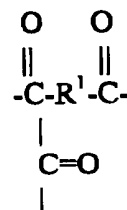
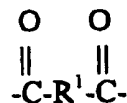
- (e) R is an intermolecular connecting group selected from
 - (i) secondary metal ions coordinated with secondary donors bonded to one or more of groups G to G₄ on the respective TECs;
 - (ii) multifunctional organic groups forming covalent bonds with one or more of groups G to G₄ on the respective TECs;
 - (iii) functional groups forming hydrogen bonds with one or more of groups G to G₄ on the respective TECs; or
 - (iiiv) non-coordinating counter-ions spaced between and separating the respective TECs;

~~the R group bonding and/or spacing the respective TECs to and from one another to maintain them in a porous framework wherein z is from 1 to 8, and wherein R may be the same or different when z is greater than 1; and~~

- (f) y is an integer sufficient to provide said porous framework of the plurality of TECs for the selective adsorption of the desired component thereon.

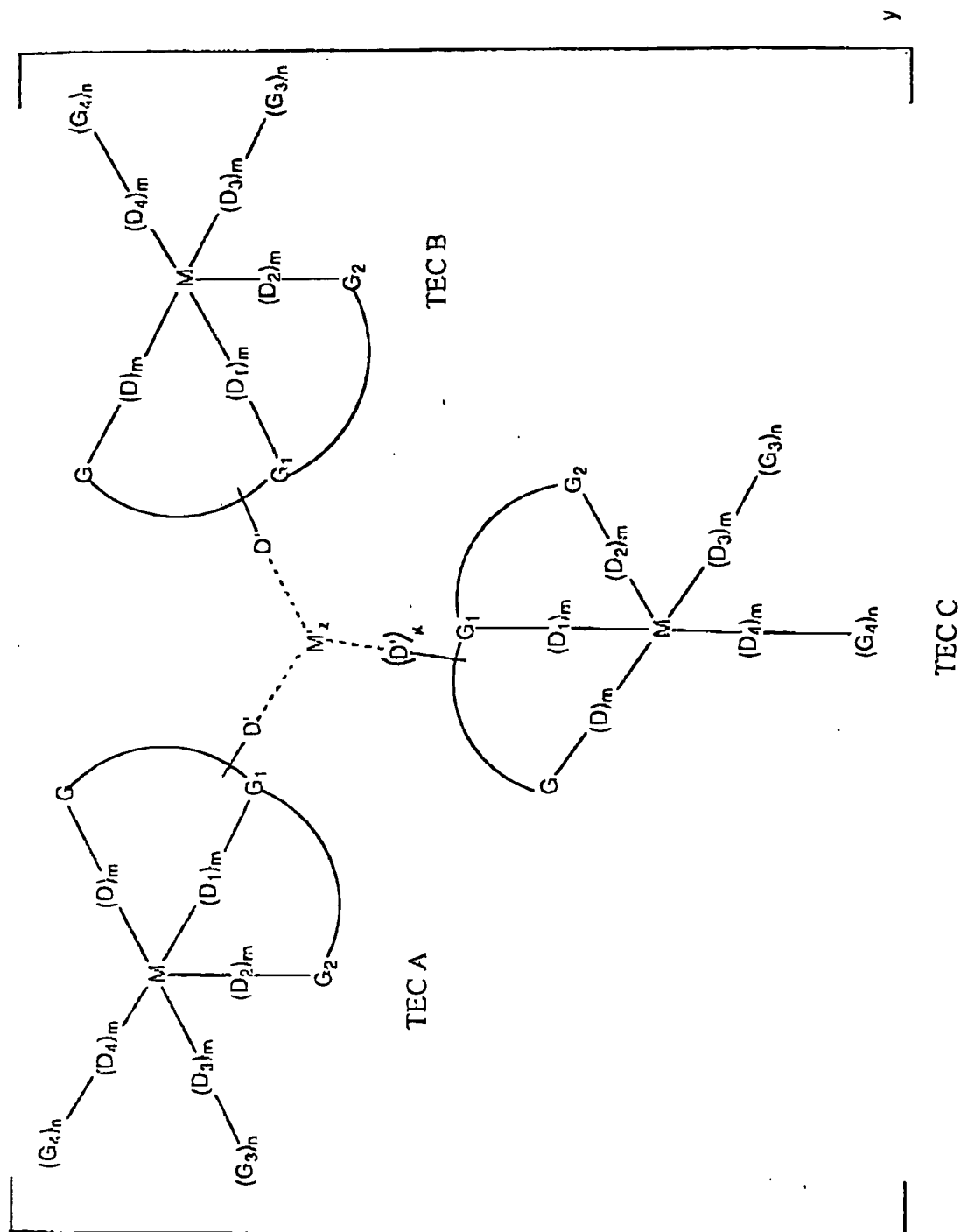
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8. The process of claim 1 for selectively adsorbing a component of a gas mixture, wherein R is a member of group (ii) and has the formula



or mixtures thereof, and wherein R^1 is a substituted or unsubstituted acyclic or carbocyclic group and is unsubstituted or is substituted by F, Cl, Br, O, N, P, S, Si or B.

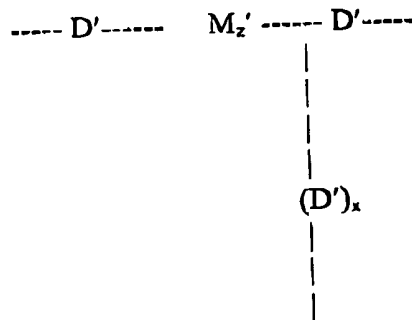
12. (Once amended) A process for selectively adsorbing oxygen from a gas mixture, which comprises contacting the mixture with a solid state, selective adsorbent material comprising a porous framework of a plurality of transition element complexes (TECs) having the formula shown below in Figure 3,



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wherein:

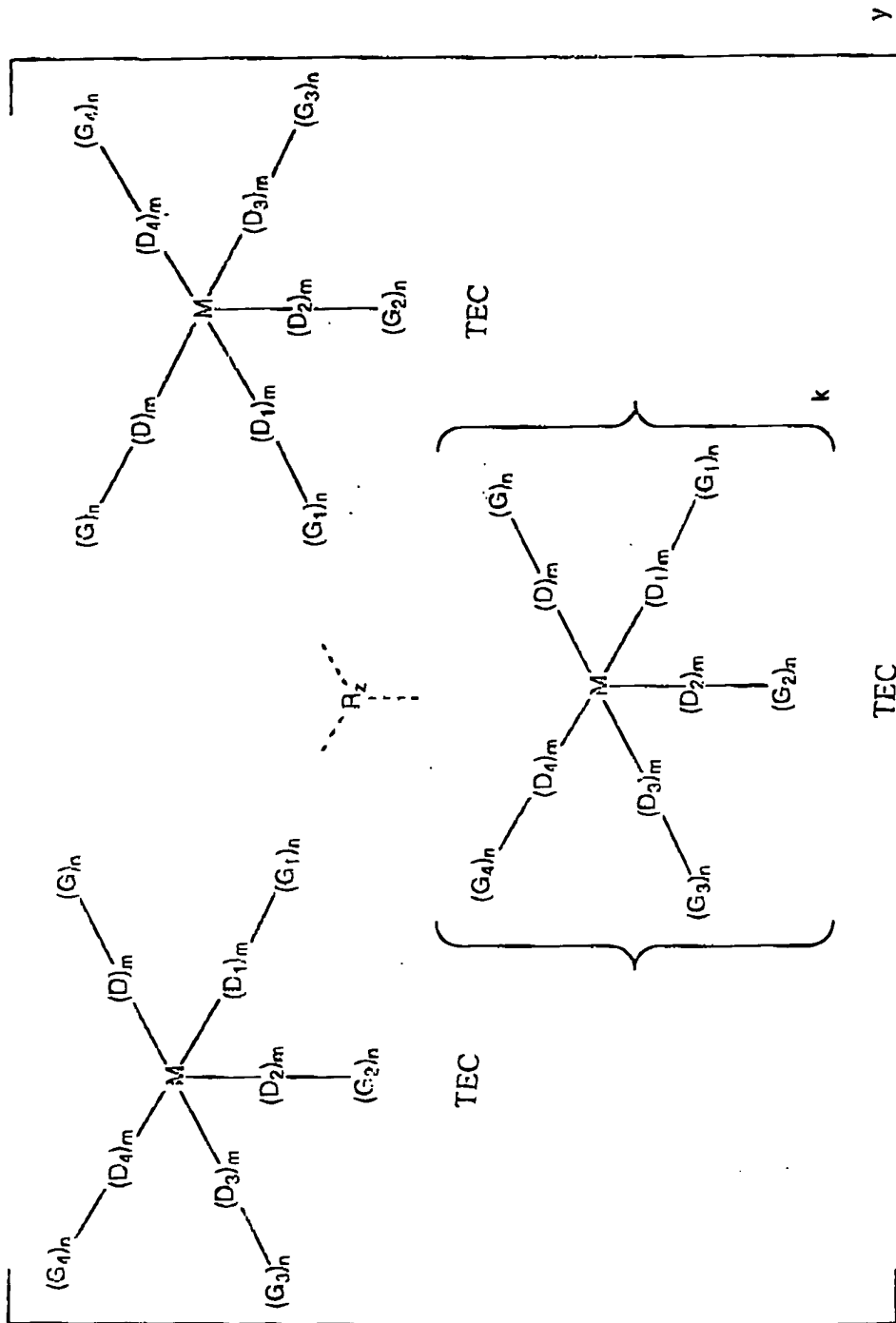
- (a) M is a primary transition metal ion selected from Co(II), Fe(II) or Mn(II);
- (b) D to D₄ are primary donors occupying primary donor coordination sites on M but leaving one open coordination site on M for an oxygen molecule to react with M;
- (c) G to G₄ are functional groups and n is zero or one, at least one of G to G₄ being intramolecularly bonded to at least three adjacent primary donors to form at least one 5 or 6 member chelate ring on the primary transition metal ion and providing at least three donors thereto;
- (d) M, D to D₄ and G to G₄ together define one or more transition metal complexes TEC A, TEC B and TEC C, wherein said complexes are the same or different;
- (e) D' is a secondary donor or a group of secondary donors bonded to a chelate ring on a coordination site on M, ~~and x is zero or one;~~
- (f) M' is a secondary metal ion coordinated with secondary donors D',



the group bonding the respective TECs to one another to maintain them in a porous framework and wherein z is from 1 to 8 and x is from 0 to 6; and

(g) y is an integer sufficient to provide said porous framework of the plurality of TECs for the selective adsorption of oxygen thereon.

13. (Once amended) A composition for selectively adsorbing a component of a gas mixture, which comprises a solid state, selective adsorbent material comprising a porous framework of a plurality of transition element complexes (TECs) having the formula shown below



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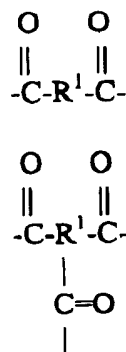
in Figure 1, wherein:

- (a) M is a primary transition metal ion;
- (b) D to D₄ are primary donors and m is zero or one, at least three of D to D₄ occupying primary donor coordination sites on M but leaving at least one open coordination site on M for the component to react with M;
- (c) G to G₄ are functional groups and n is zero or one, at least one of G to G₄ being intramolecularly bonded to at least three adjacent primary donors to form at least one 5 or 6 member chelate ring on the primary transition metal ion and providing at least three donors thereto;
- (d) M, D to D₄ and G to G₄ together define one or more transition metal complexes, wherein said complexes are the same or different and k is from 0 to 4;
- (e) R is an intermolecular connecting group selected from
 - (i) secondary metal ions coordinated with secondary donors bonded to one or more of groups G to G₄ on the respective TECs;
 - (ii) multifunctional organic groups forming covalent bonds with one or more of groups G to G₄ on the respective TECs;
 - ~~(iii) functional groups forming hydrogen bonds with one or more of groups G to G₄ on the respective TECs; or~~
 - ~~(iiiiv) non-coordinating counter-ions spaced between and separating~~
the respective TECs;

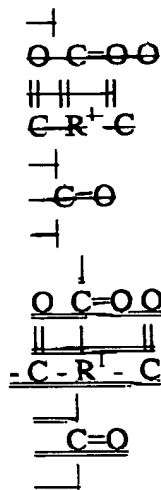
~~the R group bonding and/or spacing the respective TECs to and from one another to maintain them in a porous framework, wherein z is from 1 to 8, and wherein R may be the same or different when z is greater than 1; and~~

(f) y is an integer sufficient to provide said porous framework of the plurality of TECs for the selective adsorption of the desired component thereon.

16. The composition of claim 13 for selectively adsorbing a component of a gas mixture, wherein R is a member of group (ii) and has the formula



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or mixtures thereof, wherein R^1 is a substituted or unsubstituted acyclic or carbocyclic group and is unsubstituted or is substituted by F, Cl, Br, O, N, P, S, Si or B.

21. (Once amended) The composition of claim 132 for selectively adsorbing a component of a gas mixture, wherein R is a member of group (iv), selected from:

- (a) an alkylammonium or arylammonium cation having having the formula $-(\text{R}^1\text{R}^2\text{R}^3\text{R}^4)\text{N}^+$, wherein R^1 , R^2 , R^3 and R^4 are the same or different and are hydrogen and at least one of which is an unsubstituted acyclic or carbocyclic group or an acyclic or carbocyclic group substituted by F, Cl, Br, O, N, P, S, Si or B when the TECs are anionic; or
- (b) BF_4^- , BOR''^- , PF_6^- , NO_3^- , SO_4^{2-} , CO_3^{2-} , MoO_4^{2-} , a polyoxometallate, $\text{R}''\text{CO}_2^-$, $\text{R}''\text{O}^-$, $\text{R}''\text{SO}_3^-$, wherein R'' is a C_{1-20} alkyl or an aryl or hetero group having from 4 to 20 carbon atoms, when the TECs are cationic.